**ΠΑΝΕΠΙΣΤΗΜΙΟ ΔΥΤΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ**

Β΄ εξάμηνο, 2018

**Πληροφορική και νέες Τεχνολογίες στην Εκπαίδευση**

**1η Εργαστηριακή Εργασία**

**Τόλιας Βασίλειος, Α.Μ 4528**

Πίνακας  
περιεχομένων

Meaning of ecology 2

What ecology is 2

Levels, Scope, and Scale of Organization 3

The scope 3

Individual Ecology 4

Characteristics 4

Ecological Complexity 5

Relations of Ecology 5

Behavioral Ecology 6

Different behaviors 6

Η οικογένεια μου 7

# Meaning of ecology

## What ecology is

Ecology (from Greek: οἶκος, "house", or "environment"; -λογία, "study of")is the branch of biology which studies the interactions among organisms and their environment. Objects of study include interactions of organisms with each other and with abiotic components of their environment. Topics of interest include the biodiversity, distribution, biomass, and populations of organisms, as well as cooperation and competition within and between species. Ecosystems are dynamically interacting systems of organisms, the communities they make up, and the non-living components of their environment. Ecosystem processes, such as primary production, pedogenesis, nutrient cycling, and niche construction, regulate the flux of energy and matter through an environment. These processes are sustained by organisms with exact life history traits. Biodiversity means the varieties of species, genes, and ecosystems, enhances certain ecosystem services.

Ecology is not synonymous with environmentalism, natural history, or environmental science. It overlaps with the closely related sciences of evolutionary biology, genetics, and ethology. An important focus for ecologists is to improve the understanding of how biodiversity affects ecological function. Ecologists seek to explain: Life processes, interactions, and adaptations,the movement of materials and energy through living communities, the successional development of ecosystems, the abundance and distribution of organisms and biodiversity in the context of the environment.

Ecology has helpful applications in conservation biology, wetland management, natural resource management (agroecology, agriculture, forestry, agroforestry, fisheries), city planning (urban ecology), community health, economics, basic and applied science, and human social interaction (human ecology). For example, the Circles of Sustainability approach treats ecology as more than the environment 'out there'. It is not treated as separate from humans. Organisms (including humans) and resources compose ecosystems which, in turn, maintain biophysical feedback mechanisms that moderate processes acting on living (biotic) and non-living (abiotic) components of the planet. Ecosystems sustain life-supporting functions and produce normal capital like biomass production (food, fuel, fiber, and medicine), the regulation of climate, global biogeochemical cycles, water filtration, soil formation, erosion control, flood protection, and many other natural features of scientific, historical, economic, or intrinsic value.

# Levels, Scope, and Scale of Organization

## The scope

The scope of ecology contains a wide array of interacting levels of organization spanning micro-level (e.g., [cells](https://en.wikipedia.org/wiki/Cell_(biology))) to a planetary scale (e.g., [biosphere](https://en.wikipedia.org/wiki/Earth%27s_spheres)) [phenomena](https://en.wikipedia.org/wiki/Phenomena). Ecosystems, for example, contain abiotic [resources](https://en.wikipedia.org/wiki/Resource_(biology)) and interacting life forms (i.e., individual organisms that aggregate into [populations](https://en.wikipedia.org/wiki/Population) which aggregate into distinct ecological communities). Ecosystems are dynamic, they do not always follow a linear successional path, but they are always changing, sometimes rapidly and sometimes so slowly that it can take thousands of years for ecological processes to bring about certain [successional stages](https://en.wikipedia.org/wiki/Ecological_succession" \o "Ecological succession) of a forest. An ecosystem's area can vary greatly, from tiny to vast. A single tree is of little consequence to the classification of a forest ecosystem, but critically relevant to organisms living in and on it.  Several generations of an [aphid](https://en.wikipedia.org/wiki/Aphid) population can exist over the lifespan of a single leaf. Each of those aphids, in turn, support diverse [bacterial](https://en.wikipedia.org/wiki/Bacteria) communities.  The nature of connections in ecological communities cannot be explained by knowing the details of each species in isolation, because the emergent pattern is neither revealed nor predicted until the ecosystem is studied as an integrated whole. Some ecological principles, however, do exhibit collective properties where the sum of the components explain the properties of the whole, such as birth rates of a population being equal to the sum of individual births over a designated time frame.

Biomes are larger units of organization that categorize regions of the Earth's ecosystems, mainly according to the structure and composition of vegetation.  There are different methods to define the continental boundaries of biomes dominated by different functional types of vegetative communities that are limited in distribution by climate, precipitation, weather and other environmental variables. Biomes include [tropical rainforest](https://en.wikipedia.org/wiki/Tropical_rainforest), [temperate broadleaf and mixed forest](https://en.wikipedia.org/wiki/Temperate_broadleaf_and_mixed_forest), [temperate deciduous forest](https://en.wikipedia.org/wiki/Temperate_deciduous_forest), [taiga](https://en.wikipedia.org/wiki/Taiga), [tundra](https://en.wikipedia.org/wiki/Tundra), [hot desert](https://en.wikipedia.org/wiki/Hot_desert), and [polar desert](https://en.wikipedia.org/wiki/Polar_desert).  Other researchers have recently categorized other biomes, such as the human and oceanic [microbiomes](https://en.wikipedia.org/wiki/Microbiome" \o "Microbiome). To a [microbe](https://en.wikipedia.org/wiki/Microorganism), the human body is a habitat and a landscape. Microbiomes were discovered largely through advances in [molecular genetics](https://en.wikipedia.org/wiki/Molecular_genetics), which have revealed a hidden richness of microbial diversity on the planet. The oceanic microbiome plays a significant role in the ecological biogeochemistry of the planet's oceans.

# Individual Ecology

## Characteristics

Understanding traits of individual organisms helps explain patterns and processes at other levels of organization including populations, communities, and ecosystems. Several areas of ecology of evolution that focus on such traits are [life history theory](https://en.wikipedia.org/wiki/Life_history_theory), [ecophysiology](https://en.wikipedia.org/wiki/Ecophysiology" \o "Ecophysiology), [metabolic theory of ecology](https://en.wikipedia.org/wiki/Metabolic_theory_of_ecology), and [Ethology](https://en.wikipedia.org/wiki/Ethology" \o "Ethology). Examples of such traits include features of an organisms life cycle such as age to maturity, life span, or metabolic costs of reproduction. Other traits may be related to structure, such as the spines of a cactus or dorsal spines of a bluegill sunfish, or behaviors such as courtship displays or pair bonding. Other traits include emergent properties that are the result at least in part of interactions with the surrounding environment such as growth rate, resource uptake rate, winter, and deciduous vs. drought deciduous trees and shrubs.

One set of characteristics relate to body size and temperature. The [metabolic theory of ecology](https://en.wikipedia.org/wiki/Metabolic_theory_of_ecology) provides a predictive qualitative set of relationships between an organism’s body size and temperature and metabolic processes. In general, smaller, warmer organisms have higher metabolic rates and this results in a variety of predictions regarding individual somatic growth rates, reproduction and population growth rates, population size, and resource uptake rates.

The traits of organisms are subject to change through acclimation, development, and evolution. For this reason, individuals form a shared focus for ecology and for [evolutionary ecology](https://en.wikipedia.org/wiki/Evolutionary_ecology).

**Class Schedule**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| LESSON | TOPIC | ASSIGNMENT | Points | DUE |
| 1 | What is Distance Learning? | Wiki #1 | 10 | March 10 |
| Presentation | 20 |  |
| 2 | History &  Theories | Brief Paper | 20 | March 24 |
|  |  | Spring Break |  |  |
| 3 | Distance Learners | Discussion #1 | 10 | April 7 |
| Group Project | 50 | April 14 |
| 4 | Media Selection | Blog #1 | 10 | April 21 |

# Ecological Complexity

## Relations of Ecology

 Complexity is understood as a large computational effort needed to piece together numerous interacting parts exceeding the iterative memory capacity of the human mind. Global patterns of biological diversity are complex. This [biocomplexity](https://en.wikipedia.org/wiki/Biocomplexity" \o "Biocomplexity) stems from the interplay among ecological processes that operate and influence patterns at different scales that grade into each other, such as transitional areas or [ecotones](https://en.wikipedia.org/wiki/Ecotones" \o "Ecotones) spanning landscapes. Complexity stems from the interplay among levels of biological organization as energy, and matter is integrated into larger units that superimpose onto the smaller parts. "What were wholes on one level become parts on a higher one."  Small scale patterns do not necessarily explain large scale phenomena, otherwise captured in the expression (coined by Aristotle) 'the sum is greater than the parts'.

"Complexity in ecology is of at least six distinct types: spatial, temporal, structural, process, behavioral, and geometric."  From these principles, ecologists have identified [emergent](https://en.wikipedia.org/wiki/Emergence) and [self-organizing](https://en.wikipedia.org/wiki/Self-organization#Self-organization_in_biology) phenomena that operate at different environmental scales of influence, ranging from molecular to planetary, and these require different explanations at each integrative level.  Ecological complexity relates to the dynamic resilience of ecosystems that transition to multiple shifting steady-states directed by random fluctuations of history.

# Behavioral Ecology

## Different behaviors

All organisms can exhibit behaviours. Even plants express complex behaviour, including memory and communication. Behavioural ecology is the study of an organism's behaviour in its environment and its ecological and evolutionary implications. Ethology is the study of observable movement or behaviour in animals. This could include investigations of motile [sperm](https://en.wikipedia.org/wiki/Sperm) of plants, mobile [phytoplankton](https://en.wikipedia.org/wiki/Phytoplankton), [zooplankton](https://en.wikipedia.org/wiki/Zooplankton) swimming toward the female egg, the cultivation of fungi by [weevils](https://en.wikipedia.org/wiki/Weevils), the mating dance of a [salamander](https://en.wikipedia.org/wiki/Salamander), or social gatherings of [amoeba](https://en.wikipedia.org/wiki/Amoeba).

Adaptation is the central unifying concept in behavioural ecology.  Behaviours can be recorded as traits and inherited in much the same way that eye and hair colour can. Behaviours can evolve by means of natural selection as adaptive traits conferring functional utilities that increases reproductive fitness.

Predator-prey interactions are an introductory concept into food-web studies as well as behavioural ecology.  Prey species can exhibit different kinds of behavioural adaptations to predators, such as avoid, flee, or defend. Many prey species are faced with multiple predators that differ in the degree of danger posed. To be adapted to their environment and face predatory threats, organisms must balance their energy budgets as they invest in different aspects of their life history, such as growth, feeding, mating, socializing, or modifying their habitat. Hypotheses posited in behavioural ecology are generally based on adaptive principles of conservation, optimization, or efficiency. For example, "[t]he threat-sensitive predator avoidance hypothesis predicts that prey should assess the degree of threat posed by different predators and match their behaviour according to current levels of risk" or "[t]he optimal [flight initiation distance](https://en.wikipedia.org/wiki/Escape_distance) occurs where expected postencounter fitness is maximized, which depends on the prey's initial fitness, benefits obtainable by not fleeing, energetic escape costs, and expected fitness loss due to predation risk.

# Η οικογένεια μου